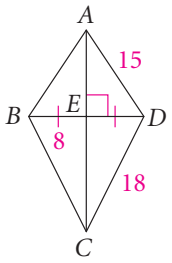
EXERCISES

For more practice, see *Extra Practice*.

Practice and Problem Solving

A Practice by Example

Use the figure at the right for Exercises 1–4.



Example 1 (page 250)

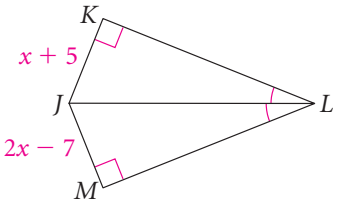
1. From the information given in the figure, how is $\overline{AC}$ related to $\overline{BD}$?

2. Find AB. **3.** Find BC. **4.** Find ED.

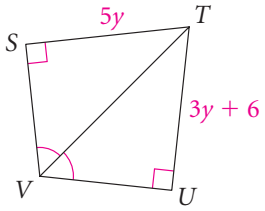
5. On a piece of paper, mark a point H for home and a point S for school. Describe the set of points equidistant from H and S.

Example 2 (page 251)

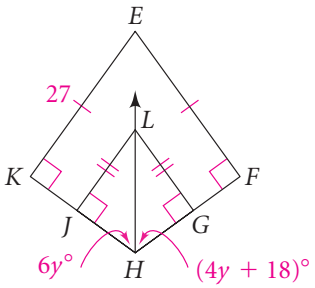
6. Algebra Find x, JK, and JM.



7. Algebra Find y, ST, and TU.



Use the figure at the right for Exercises 8–11.



8. From the information given in the figure, how is $\overrightarrow{HL}$ related to $\angle JHG$? Explain.

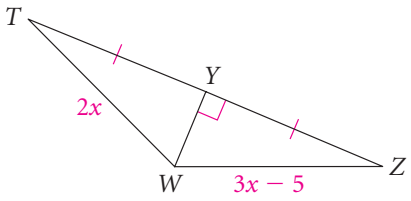
9. Find the value of y, then find $m\angle FHL$ and $m\angle KHL$.

10. Find EF.

11. What can you conclude about point E?

B Apply Your Skills

Algebra Use the figure, below right, for Exercises 12–16.



12. Find the value of x.

13. Find TW.

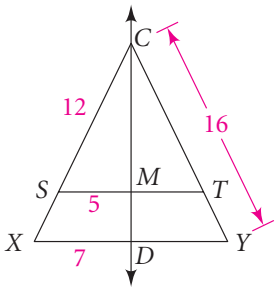
14. Find WZ.

15. What kind of triangle is $\triangle TWZ$? Explain.

16. If R is on the perpendicular bisector of $\overline{TZ}$, then R is __?__ from T and Z, or __?__ = __?__.

17. Write Theorems 5-2 and 5-3 as a single biconditional statement.

$\overleftrightarrow{CD}$ is the perpendicular bisector of both $\overline{XY}$ and $\overline{ST}$, and $CY = 16$. Find each length.



18. CT **19.** TY

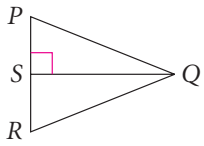
20. SX **21.** CX

22. MT **23.** ST

24. DY **25.** XY

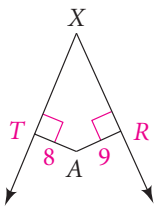
26. What kind of triangles are $\triangle SCT$ and $\triangle XCY$? Explain.

27. Error Analysis To prove that $\triangle PQR$ is isosceles, a student began by stating that since Q is on the segment perpendicular to $\overline{PR}$, Q is equidistant from the endpoints of $\overline{PR}$. What additional information does the student need in order to make that statement?



Writing **Determine whether point A must be on the bisector of $\angle TXR$. Explain.**

28.



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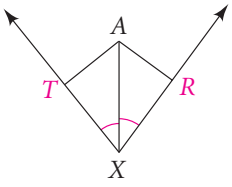

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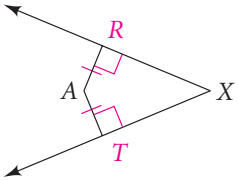
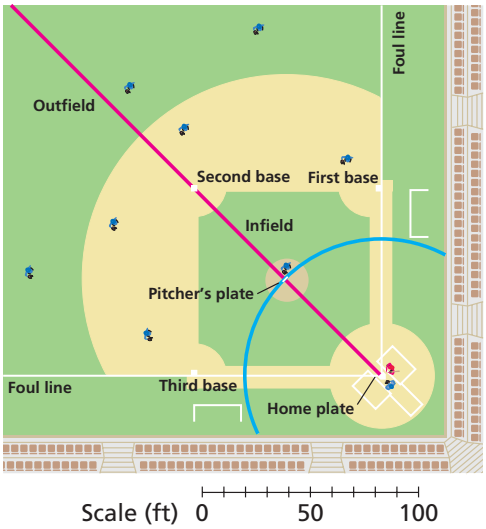


31. Baseball What is the common name for the part of a baseball field that is equidistant from the foul lines and 60 ft 6 in. from home plate?



32. a. Constructions Draw a large triangle, $\triangle CDE$. Construct the angle bisectors of each angle.

b. Make a Conjecture What appears to be true about the angle bisectors?

c. Test your conjecture with another triangle.

33. a. Constructions Draw a large acute scalene triangle, $\triangle PQR$. Construct the perpendicular bisectors of each side.

b. Make a Conjecture What appears to be true about the perpendicular bisectors?

c. Test your conjecture with another triangle.

Need Help?

In Exercise 33a, your construction may suggest something but be slightly off. If so, test your conjecture *very* carefully in part (c).

Coordinate Geometry **Find two points on the perpendicular bisector of $\overline{AB}$. Verify your results by showing each point is equidistant from A and B.**

34. $A(0,0), B(0,4)$

35. $A(0,2), B(6,2)$

36. $A(3,3), B(3,-3)$

37. $A(3,0), B(0,3)$

38. $A(3,0), B(1,4)$

39. $A(3,0), B(2,5)$

40. Coordinate Geometry You are given points $A(6,8)$, $O(0,0)$, and $B(10,0)$.

a. Write equations of lines ℓ and m such that $\ell \perp \overleftrightarrow{OA}$ at A and $m \perp \overleftrightarrow{OB}$ at B.

b. Find the intersection C of lines ℓ and m.

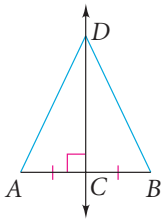
c. Show that $CA = CB$.

d. Explain why C is on the bisector of $\angle AOB$.

Proof **41. Developing Proof** Complete this paragraph proof of the Perpendicular Bisector Theorem.

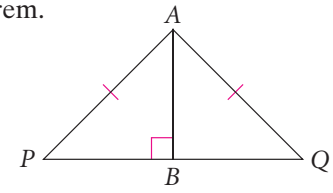
Given: $\overleftrightarrow{CD} \perp \overline{AB}, \overleftrightarrow{CD}$ bisects $\overline{AB}$.

Prove: $DA = DB$



Proof: $\overline{AC} \cong \overline{BC}$ by definition of __?__.
$\overleftrightarrow{CD} \perp \overline{AB}$, so $\angle DCA$ and $\angle DCB$ are __?__ angles.
Therefore, $\angle DCA \cong \angle DCB$.
$\overline{DC} \cong \overline{DC}$ by the __?__ Property of Congruence.
Therefore, $\triangle CDA \cong \triangle CDB$ by __?__. $\overline{DA} \cong \overline{DB}$ because __?__, so $DA = DB$.

42. Developing Proof Complete the paragraph proof of the Converse of the Perpendicular Bisector Theorem.



Given: $AP = AQ$ with $\overline{AB} \perp \overline{PQ}$ at B.

Prove: $\overline{AB}$ is the perpendicular bisector of __?__.

Proof: $\triangle ABP$ and $\triangle ABQ$ are right triangles with a common leg and congruent hypotenuses.
Thus $\triangle BAP \cong$ __?__ by the HL Theorem. $\overline{PB} \cong \overline{BQ}$ using __?__, so $\overline{AB}$ bisects $\overline{PQ}$ by the definition of __?__. Hence, $\overline{AB}$ is the perpendicular bisector of $\overline{PQ}$.

43. Developing Proof Use the paragraph proof from Exercise 41 or 42 to help you write a flow proof of either the Perpendicular Bisector Theorem or the Converse of the Perpendicular Bisector Theorem.

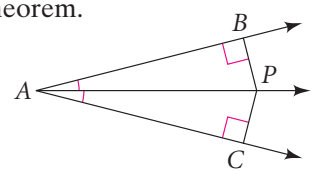
Coordinate Geometry **Write an equation of the perpendicular bisector of $\overline{AB}$.**

44. $A(0, 0), B(6, 0)$ **45.** $A(1, -1), B(3, 1)$ **46.** $A(-2, 0), B(2, 8)$

Challenge

47. Reasoning Sketch a line equidistant from three noncollinear points. Explain your procedure.

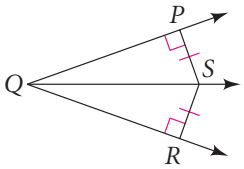
Proof **48.** Write a paragraph proof of the Angle Bisector Theorem.



Given: $\overline{PB} \perp \overrightarrow{AB}, \overline{PC} \perp \overrightarrow{AC}$, $\overrightarrow{AP}$ bisects $\angle BAC$.

Prove: $PB = PC$

Proof **49.** Write a proof of the Converse of the Angle Bisector Theorem.

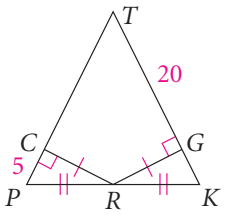


Given: $\overline{SP} \perp \overrightarrow{QP}, \overline{SR} \perp \overrightarrow{QR}, SP = SR$

Prove: $\overrightarrow{QS}$ bisects $\angle PQR$.

Standardized Test Prep

Multiple Choice Use the figure at the right for Exercises 50–52.



50. What is TK?
A. 4 **B.** 5 **C.** 15 **D.** 25

51. If $m\angle CTR = 27$, what is $m\angle K$?
F. 27 **G.** 54 **H.** 63 **I.** 76

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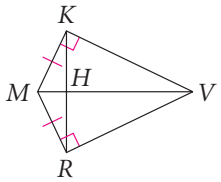
52. Suppose $RK = 8$. What is the perimeter of $\triangle TPK$?
A. 25 **B.** 33 **C.** 50 **D.** 66

Short Response

53. In the figure at the right, explain why $\overline{MV}$ is the angle bisector of $\angle KVR$.

Extended Response

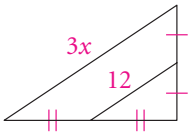
54. In the figure at the right, explain why $\overline{MV}$ is the perpendicular bisector of $\overline{KR}$.



Mixed Review

Lesson 5-1 x^2 **Algebra** **Find the value of x.**

55.



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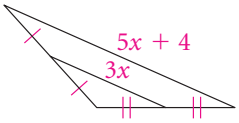

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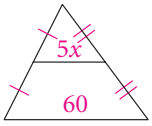

Lesson 2-4 **Name the property that justifies each statement.**

58. $AB = AB$

59. If $2x = 30$, then $x = 15$.

60. If $x = 30 - x$, then $2x = 30$.

61. $3(4x - 1) = 12x - 3$

62. If $m\angle 3 = m\angle 4$ and $m\angle 4 = m\angle 5$, then $m\angle 3 = m\angle 5$.

63. If $\angle 3 \cong \angle 4$ and $\angle 4 \cong \angle 5$, then $\angle 3 \cong \angle 5$.

Lesson 1-6 **Coordinate Geometry** **Find C the midpoint of $\overline{AB}$. Then show that $AC = CB = \frac{1}{2}AB$.**

64. $A(0, 5), B(6, 8)$ **65.** $A(-2, 8), B(2, -1)$ **66.** $A(5, 3), B(6, 7)$